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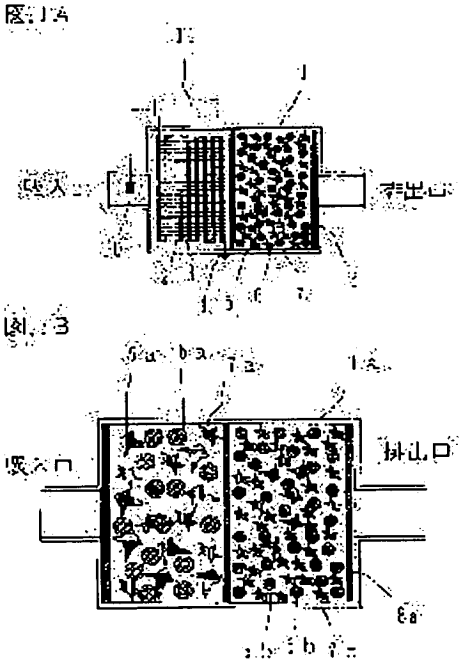
(54) HIGHLY EFFICIENT GAS PROCESSING SYSTEM USING ELECTRIC DISCHARGE

(57)Abstract:

PROBLEM TO BE SOLVED: To implement real-time processing depending on an operational state of an engine with inexpensive and durable structure, by performing processing in which NO is completely decomposed from NOx in exhaust gas by using electric discharge to generate NO2 required for oxidizing fine particles at a low temperature of 300°C in a real time without influence of sulfur or the like in fuel, an particulate matters are completely decomposed by using ozone or active oxygen as oxidant simultaneously generating in the atmosphere of the NO2 and at the low temperature of about 300°C and by using an inexpensive catalyst.

SOLUTION: Of all Nox in the exhaust gas, the NO is completely decomposed by a bare discharge wire from and NO2 required for oxidizing fine particles at the low temperature of about 300° C is generated in real time without the influence of the sulfur in the fuel, so that the processing is performed depending on the operational state of the engine. The particulate matters are completely decomposed by using the NO2 generated by the electric discharge and the ozone or activated oxygen simultaneously generated in the atmosphere of oxygen as oxidant at the low temperature of about 300° C and by using he inexpensive catalyst.



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CLAIMS

[Claim(s)]
[Claim 1] Make it cylindrical, tabular, etc., and cover by the envelope of an insulator, set another electrode by each configuration, and it is made open wire. in order to make as low as possible the electrical potential difference impressed to inter-electrode -- one side of an electrode -- a long line and band-like -- Carry out adhesion arrangement at the shape of reticulated or zigzag etc., and ozone and barrier discharge are generated effectively and made. an insulating core wire is met -- making -- parallel, a right angle, and a spiral -- The discharge generator characterized by decomposing NO effectively, changing a wave (a pulse-like wave being included), high-frequency voltage, and a frequency so that this may be especially converted into NO2 efficiently in an oxygen ambient atmosphere, and dealing in a complement.
[Claim 2] The discharge generator characterized by carrying out decomposition removal of NOx, such as NO and NO2, completely in the discharge generator explained by claim 1 by changing suitably a wave (a pulse-like wave being included), high-frequency voltage, and a frequency also in an oxygen ambient atmosphere.
[Claim 3] The discharge generator characterized by changing NO2 for high-frequency voltage, a frequency, etc., and only a complement making decomposition and a reaction generate NO2 in the discharge generator explained by claim 1 after removing NO completely, and enabling it to control.
[Claim 4] Processors, such as exhaust gas characterized by controlling [using claims 1-3] the amount and component of NOx, such as NO, and removal of NO2 or generation of NO2 required for particulate matter processing, according to the situation of exhaust gas combining a catalyst at degree process to processing of the diesel exhaust gas containing particulate matter etc., and removing particulate matter at the low temperature around 300 degrees C using a catalyst.
[Claim 5] Processors, such as exhaust gas characterized by putting energy saving and saving resources into practice, and attaining a required function with an easy and cheap configuration by constituting in claim 4 using a vanadium oxide, molybdenum oxide, an alumina, a zeolite, etc., without hardly using noble metals, such as platinum and palladium, for a catalyst.
[Claim 6] The particulate matter processors in the exhaust gas characterize by to make particulate matter stick to the filter made from the penetrable ceramics etc. , to divide into the unit or two or more electrode pairs which be allotted to the adsorption side , to have sense the adhesion situation of particulate matter with inter-electrode resistance etc. always or intermittently , to have process inter-electrode [required for processing] alternatively , and to enable improvement in the engine performance , and functional maintenance comprehensively so that processing futility by the location may not be make etc.
[Claim 7] Processors, such as an exhaust gas compact and characterized [as is made to perform NOx decomposition, and generation of NO2 and disassembly of particulate matter to coincidence in reduction catalysts supported at particulate matter oxidation catalysts, such as vanadium and a molybdic-acid ghost, or an alumina and an oxidization gallium in insulating materials, such as ceramics of the insulating core wire of claim 1, or the filter made from the ceramics of claim 6, such as metal tin and an indium, makes briefer structure configurations, such as improvement in effectiveness and saving of materials, and] by low-price high performance.
[Claim 8] Processors, such as an exhaust gas characterized by the thing for which flattery processing was efficiently enabled according to the component of exhaust gas -- it can process completely even if it uses no catalyst of noble metals etc. by combining the NOx processor and claim 6 using barrier discharge of claims 1-3 etc., and a low price can moreover be realized with an easy configuration.
[Claim 9] Processors, such as an exhaust gas which holds the high-pressure reactor and plasma synthesizer unit of ammonia to a device, generates ammonia from the hydrogen which generated the nitrogen and water

in air by electrolysis etc. by discharge etc. as required, and is characterized for decomposition of NOx by making it insurance and make it carry out efficiently using it.
[Claim 10] Processors, such as an exhaust gas characterized by having reinforcement, endurance, and the structure of the discharge ray which supported the catalyst on these lines further and enabled discharge and catalyst processing in the same location as coincidence by constituting a discharge ray from lines, such as an alumina and glass, in a part of **** in the object made reticulated, tubed, and blanket-like. [Claim 11] In the object which used heat resisting materials, such as an alumina, for the insulation of an insulating core wire at the envelope, and made the discharge ray reticulated, tubed, and blanket-like Arrange so that two or more discharge rays may not contact electrically, and the suitable potential of a direct current or an alternating current is given among these discharge rays. Structure of the discharge component characterized by for the current having flowed when covered between this line with the conductive matter, for example, the electrolytic solution and carbon system particulate matter, and having made incineration and desiccation cause, and making and carrying out them. [Claim 12] Cracking units, such as exhaust gas characterized by carrying out decomposition removal of NOx energy-saving-wise and stably as the equipment in which supply of oxygen and accommodation are possible is formed in a system and an oxygen density can be changed according to the amount of NOx decomposed in gas in the discharge generator which was made to carry out decomposition removal of NOx, such as NO and NO2, completely in claim 2. [Claim 13] In the discharge generator which sets to claim 3, and decomposed and generated NOx, such as NO and NO2, completely Form in a system the equipment in which supply of hydrocarbon gas and accommodation are possible, and it enables it to change the concentration of a hydrocarbon according to the amount of the particulate matter disassembled in gas. Cracking units, such as exhaust gas characterized by carrying out decomposition removal of decomposition of NO, generation of NO2, and the particulate matter for NOx or particulate matter energy-saving-wise and stably. [Claim 14] The NOx cracking unit characterized by detecting NOx before and behind processing, and NO2 concentration, grasping a stationary and the change situation of increase and decrease, and determining a spark discharge energy control point when carrying out in claims 1-5, claims 9-9, and claims 12-13 by controlling the spark discharge energy according the amount of NO2 or NOx to applied voltage etc. [Claim 15] The exhaust gas processing system which is excellent at thermal resistance in order to give compatibility with an established generator where additional quantity of electricity required for offgas treatment is added, and is characterized by enabling it to exchange with the generator is efficient and it was made not to have trouble in exchange of size or an installation top exhaust gas treater in the exhaust gas treater used for migration machines, such as an automobile, by discharge or energization. [Claim 16] The configuration method of the processor characterized by improving productivity, dependability, and maintainability by leaps and bounds while raising capacity accommodation and endurance by carrying out the modularization of the processing element for every function, and constituting from a serial or juxtaposition, those combination, etc. in the exhaust gas processor in order to raise capacity and endurance. [Claim 17] The discharge element which consists of two or more discharge rays, enables adjustment of the die length of a discharge ray, or makes a size switchable, and is characterized by enabling it to change a discharge property freely appropriately in a discharge insulated wire. [Claim 18] The exhaust gas processor characterized by carrying out addition adjustment of oxygen and a hydrocarbon etc. in the equipment which disassembles particulate matter if needed, without using no catalyst for the generation and coincidence of NO2 by discharge with a sulfur oxide, a sulfur oxide supported beforehand in a fuel, and removing particulate matter completely. [Claim 19] The exhaust gas processor characterized by adopting heat insulation structure in order to utilize effectively the heat which generated disassembly of harmful gas or particulate matter, generation, and removal within equipment in order to carry out certainly and in energy saving, insurance and in an exhaust gas treater. [Claim 20] The exhaust gas processor using the discharge insulated wire characterized by making the dependability and cost of improvement in a throughput, or processing improve by leaps and bounds by combining the adjustment and the electric spark discharge energy adjustment of a discharge ray by the discharge ray of claim 17, and performing organic adjustment.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] The exhaust gas processor which promotes decomposition, the chemical reaction, etc. of the hazardous chemical substances in the exhaust gas discharged from the boiler containing NOx, particulate matter, a hydrocarbon, etc., an engine, etc. is begun, and it is concerned with a chemical plant, environmental ******, etc.
[0002]
[Description of the Prior Art] Even if it sees globally the processing technique of NOx in the conventional exhaust gas, or a particle, the technique which can carry out decomposition processing of all the harmful matter cheaply and effectively is not established yet. Although the denitrification technique which used ammonia as processing of fixed machines, such as a boiler and an engine generator, as a removal technique of NOx is established, it is not used for migration machines, such as an automobile, from the standpoint on insurance. Moreover, although measures are taken by NOx removal of a diesel rolling stock in engine high-pressure injection, the configuration of a combustion chamber, etc., the satisfactory technique is not established only by it. NO2 is generated for NOx in exhaust gas using precious metal catalysts, such as platinum and palladium, although there is equipment which decomposes a particle with the catalyst of a back process, the NOx reduction effectiveness is as low as about 15%, and ** and a still full-scale processor are not established. Moreover, although there are some which used the three-way catalyst for the subject about noble metals, expensive and full-scale utilization is not carried out. In this case, the platinum used for a catalyst is the requisite for utilization of the spread of low sulfur fuel by the fall of the catalyst function under the effect of the sulfur in a fuel. On the other hand, although the technique which carries out low-temperature decomposition removal with noble metals, such as platinum, is established as a removal technique of particulate matter by the oxidative degradation by the above-mentioned NO2, since the price is expensive, full-scale spread has not been performed. Although the approach of processing by the combustion after adsorption and adsorption with the filter made from the current ceramics is put in practical use, and there is an approach using a mutual processing system in batch processing or two or more processing network, it is the actual condition to have checked full-scale spread by the expensive point, the badness of user-friendliness, etc. The equipment to which a diesel power plant can regenerate what all current processors are fixed, follows at operational status, and can be processed to the component of the harmful matter in exhaust gas changing a lot, and a throughput fall on real time according to an operation situation is not realized.
[0003]
[Problem(s) to be Solved by the Invention] Without being influenced of the sulfur in a fuel etc., NO should decompose NOx in an exhaust gas completely using discharge, and establish the technique which generates NO2 required to oxidize a particle at about 300-degree C low temperature on real time. Use for an oxidizer ozone and active oxygen which are generated in coincidence in NO2 generated by ****, and an oxygen ambient atmosphere, and establish the technique which disassembles particulate matter for a catalyst completely at the low temperature around 300 degrees C, without using at all, using a cheap catalyst. ** Establish the technique which follows an engine operation situation and can be processed on real time. Establish the technique of attaining **** to ** with the configuration which was cheap and was moreover excellent in endurance. ** Accompany, have equipment which generates ammonia on its own account, and build to make it function to processing of NOx etc. effectively. ** Build to a system an established generator and the efficient generator excellent in the thermal resistance which gave compatibility, covering additional electric capacity, when processing exhaust gas by discharge or energization. ** [0004]

[Means for Solving the Problem] ** Without being influenced of the sulfur in a fuel etc., NO decomposes NOx in an exhaust gas completely using discharge, and as a solution of establishing the technique which generates NO2 required to oxidize a particle at about 300-degree C low temperature on real time, as a means performed without being probably influenced of the sulfur in a fuel, perform NO2 generation without using platinum for a catalyst. That is, it is using barrier discharge etc. In order to make as low as possible the electrical potential difference impressed to inter-electrode as the concrete example, Cover one side of an electrode by the envelope of a long line, band-like, and the thin insulator that made it cylindrical, tabular, etc. and was excellent in malleability, such as ceramics and heat-resistant silicone, set another electrode by the configuration of an insulating core wire, respectively, and it is made open wire. an insulating core wire is met -- making -- parallel, a right angle, and a spiral, if carry out adhesion arrangement at the shape of reticulated or zigzag etc., it is made to generate ozone generating and barrier discharge effectively, the alternating current high voltage is applied to inter-electrode and an electrical potential difference and a frequency are changed NO in the exhaust gas which has residual oxygen falls, and if a certain electrical potential difference is reached, it will become zero as an electrical potential difference is raised. On the other hand, although NO2 is small (1/10 or less) compared with NO at first, it increases gradually, if NO shows peak value in the range of zero and raises an electrical potential difference further, will decrease gradually and will serve as zero soon. At this time, NOx is lost completely. In this case, the range which disappears completely [NO and NOx] becomes large, so that an oxygen density and the concentration of a hydrocarbon are high. That is, the processing which energy of NOx decomposition could be made small and stabilized is attained. A reverse trapezoid curve with a long base can be obtained from V curve by control of an oxygen density or the concentration of a hydrocarbon. The offgas treatment stabilized by making it the configuration which controls such concentration in an offgas treatment system becomes possible. NO becomes possible [dealing in the property which changes NO2 to an increment and increases it from zero] on a certain electrical potential difference to which an electrical potential difference is made to increase furthermore. This phenomenon is applied, and NO can control NO2 by slight change of an electrical potential difference in the range of zero in an instant, follows the range from peak value to zero at engine actuation, and can generate NO2 required to convert into CO2 according to the amount of particulate matter on real time. As for this control, it is needless to say for it to be possible in the small field of spark discharge energy and a high field. It is necessary to set up the capacity of the discharge element and power unit which, of course, fitted engine magnitude and an engine operation situation, and equipment required for control. If barrier discharge of this example is used, it is a discharge element 80cm thing, and power consumption also has from 10 20W and the description which can process few on the electrical potential difference of comparatively low 18kHz and 6.5kv extent. in addition, the case of a spiral discharge ray -- Table 1 -- like -- winding -- pitch 10mm -- the result the thing of order excels [result] in decomposition effectiveness most is obtained. Although it is about establishing the technique which uses for an oxidizer ozone and active oxygen which are generated in coincidence in NO2 generated by ** **, and an oxygen ambient atmosphere, and disassembles particulate matter completely using a cheap catalyst at the low temperature around 300 degrees C ** Since the amount of described NO2 or ozone (400 degrees C or more active oxygen) is freely controllable in an electrical potential difference, a frequency, and a wave (a pulse is included) Particulate matter can be completely disassembled without making vanadium, the oxide and zeolite of molybdenum, and an alumina into a catalyst and using most noble metals at the low temperature around 300 degrees C. Moreover, it also becomes possible by control of the amount of generation of NO2 to disassemble particulate matter without a catalyst with sulfur oxides, such as a sulfuric acid made in oxidation of the sulfur in the nitric acid which reacted with generated NO2 and the water in gas, and was made, or a fuel, etc. ** About establishing the technique which follows an engine operation situation and can be processed on real time ** Using NO2 generation control technique in described NO zero state, follow operation situations, such as an engine, calculate the amount of particulate matter from a sensor or operational characteristics, and generate NO2 required amount in an instant. . particulate matter sensor which can disassemble particulate matter completely is arranged in the entry section of a processor, sensing is carried out to real time, and the information is inputted into the controller. on the other hand -- the passage order of a treater -- NOx or NO sensor -- allotting -- the concentration after treater passage -- an increasing state -- or a decreasing state is grasped, NO2 amount required for full disassembly of particulate matter by NOx after processing and the concentration of NO is calculated, the electrical-potential-difference value corresponding to the required amount of energy is decided, an electrical potential difference is controlled on real time, and NOx and particulate matter are removed completely. Although it is establishing the technique of attaining ** ** to ** with a cheap configuration, becoming the big element of cost with the exhaust-gas processing

system of this invention describes a discharge element, a low-temperature catalyst, and the three major elements of a control unit. First, although it is a discharge element, which spiral discharge ray is allotted to the surroundings of a long and slender discharge core wire, and it has easy structure, and it can manufacture in large quantities easily with the technique which makes an optical fiber and an electric wire, and the cheap thing which was excellent also in dependability can be manufactured. Next, since small [at a percent by weight] or the prospect realizable in about 0.2% of amount is acquired, and an alumina, a zeolite, etc. are made to live together in the oxide of comparatively cheap vanadium or molybdenum and are constituted in it even if it uses without using no noble metals fundamentally, as ** also described the catalyst, compared with an ordinary noble-metals subject's catalyst, it is very cheap, and can collect. Since NO decomposition and NO2 generation being comparatively performed with small power and control can also be performed with easy techniques, such as an electrical potential difference and a frequency, a power source and a control section can be cheaply summarized using the latest electronic technique.
** It accompanies, it has equipment which generates ammonia on its own account, it has the hydrogen feeder generated with N2 gas, a fuel cell, etc. in air about build so that it may be make to function to processing of NOx etc. effectively in a migration machine, and it becomes possible to generate ammonia using a discharge component and to defang N2 and hydrogen with the NOx processing technique currently perform with the fixed vessel.
** The low starting torque which building to a system an established generator and the efficient generator excellent in the thermal resistance which gave compatibility, covering additional electric capacity when processing exhaust gas by discharge or energization, therefore an artificer devised, It becomes realizable, using ceramics, such as an alumina, for the insulating section of covering of more than efficient (95%), a coil, and the slot insulation and the coil that can almost raise ordinary 250 degrees C for service temperature with the generator of zero even to 500 degrees, and giving compatibility with an established generator.
[0005]
[Embodiment of the Invention] Hereafter, the example of the gestalt of implementation of this invention is explained with reference to a drawing. Drawing 1 A and drawing 1 B are exhaust gas processors in which this invention and an ordinary example are shown, respectively. Greatly, the processing section is divided into two, and the description of the structure of this invention carries out processing by barrier discharge at a last process, and has the composition of processing according to a catalyst at a back process. Barrier discharge sticks the naked discharge ray 3 to a long and slender unit or two or more insulating core wires 2 on the surface of an insulator, it knits to blanket-like like the example of the shape of a spiral, or drawing, or it is carried out, and discharge constitutes space so that it may spread uniformly. It connects with the ground 4 and the edge of a discharge ray 3 makes a discharge ray generate barrier discharge efficiently by the RF high voltage made from the power control section 11 which built in the RF high-voltage transformer assembly between insulating core wires. Of course, the RF high voltage power supply used for this may make a sine wave the shape of a pulse, may make an electrical potential difference the same in power, and may raise an electrical potential difference. A sensor 10 is the example of - which detects engine operating state and detects particulate matter and NOx directly, and another means (un-illustrating), such as an engine rotational frequency, may perform it. By decomposing completely NOx discharged from an engine etc. in this discharge section especially NO, and NO2, or changing an electrical potential difference, a frequency, and a wave, NO was decomposed completely, and it changes into the condition of only NO2, or has found out that that amount is controllable. Although drawing 3 R> 3 explains in detail later, it is the epoch-making thing which can realize the property that NO2 can be changed a lot, for example by change of few electrical potential differences, with very slight electric energy, can manufacture while the structure of a discharge ray moreover secures dependability by the manufacturing technology of a very simple electric wire or an optical fiber, and can also realize cost very at a low price. NO2 detects a complement by the sensor 10, although the particulate matter of a back process is oxidized, and he is trying to make it generate it by the gas of an oxidizing quality in this invention. It is the present condition that this point does not have a control function at all by the ordinary device. That is, the discharge section of this invention is the epoch-making thing which can follow efficiently the decomposition of NOx and the generation of NO2 which suited the situation on real time while grasping an engine situation exactly. Since the drawing 1 B ordinary device is generating NO2 for the catalyst, using the platinum of noble metals in large quantities, it is very expensive, and it has the fault to which a function moreover falls under the effect of the sulfur in a fuel. Next, the catalyst processing section of a back process is explained. In this part, the catalyst which can moreover mainly disassemble particulate matter at about 300-degree C low temperature completely is used. For example, a vanadium oxide 5 and molybdenum oxide 6 tend to be begun, NO2 tends to be effectively used using

comparatively cheap catalysts, such as an alumina or a zeolite 7, and it is going to decompose completely. These catalysts are realized without using most noble metals. The penetrable good septum by which 1 holds the frame of a device and 8 holds a catalyst is shown. The ordinary exhaust air processing machine of drawing 1 B is explained. At the last process, NO in NOx tends to be oxidized to NO2 using a lot of platinum 5a, palladium 6a, or alumina 7a, and it is going to carry out oxidation defanging of the particulate matter with the catalyst of a back process, since noble metals are used, it becomes expensive, and it has become the factor which greatly checks spread. As opposed to engine actuation, can follow this catalyst method, and it cannot be processed in a particle-like generating situation, but it is in a situation without the management to effect and degradation of the sulfur in a fuel. NO cannot be removed completely, either but it has been the actual condition that 85% is emitted from the exhaust port. It is called a still incomplete processing machine and is in the situation which is not an overstatement. Using a noble-metals subject's catalyst also about the back process, it is processing using platinum 5b, palladium 6b, and alumina 7b. 1a shows the frame of a device, and the penetrable good septum by which 8a holds a catalyst.

[0006] Drawing 2 A to F is explained. Here, the example of the structure of the discharge ray which is the radical management article of this invention is shown, and drawing 2 A and drawing 2 B are made of insulator 2a made with the thin and strong ingredient excellent in the malleability of the ceramics which has covered core wire 22a which constitutes a long and slender insulating core wire, and its envelope, heat-resistant silicone rubber, etc. The electrode is formed by 0.3mm and thin nakedness discharge ray 3a from the diameter of 0.2mm by which adhesion arrangement was carried out almost in parallel with this insulating core wire. 17a is used for electric isolation in case an insulator draws out a nakedness discharge ray to the device exterior. The reliable manufacturing technology of an electric wire or an optical fiber can be used, and a cheap and highly efficient discharge ray can be made from this easy structure. The thing which has good effectiveness and which moreover excelled [ingredient / which mixed zircon with the alumina / which was very much excellent in malleability] in insulation is also possible. Drawing 2 C and drawing 2 D show the example which has arranged arrangement of discharge ray 3b spirally to insulating core wire 2b and 22b. If various spiral pitches are changed, an NOx decomposition property will change a lot and manufacture of the thing suitable for engine exhaust gas disassembly of it will be attained. The thing of the difference in twice is also made in consumption energy. 17b is an insulator. next, drawing 2 E -- it drawing 2 F attaches and explains. The example which constructed the configuration of discharge ray 3c reticulated, and has been arranged to tubed to the insulating core wires 2c and 22c is shown. making it tubed -- a discharge ray -- strong -- carrying out -- giving endurance **** -- a conductor -- it is also possible to knit with ceramic lines, such as except, for example, glass, and an alumina, a catalyst can be supported to this ceramics and the effectiveness of exhaust gas decomposition, such as generating ozone and active oxygen more effectively or becoming possible [also carrying out decomposition processing also of NO2 generation, simultaneously the particulate matter at once], can also be gathered. If various pitches of a spiral discharge ray are changed, an NOx decomposition property will change a lot and manufacture of the thing suitable for engine exhaust gas disassembly of it will be attained. Degradation of a discharge ray is prevented and an example which considers being used under severe conditions and has the description preeminent for endurance is shown. 17c is an insulator. Moreover, it is also possible to coil around the same insulating core wire the discharge ray with which two or more pitches differ, to connect the pole of an edge, or to separate [it is parallel, or cross, combine two or more discharge rays, or], and to give a different discharge property to one discharge ray, or to improve endurance several times.

[0007] Drawing 3 is drawing showing an example of a property to the alternating current impression change of potential in NOx decomposition of the spiral discharge ray of this invention, and the situation of change of NOx, NO, and NO2 understands it by change of an electrical potential difference. NO decreases rapidly according to a power surge, and disappears completely by 6kV, a zero state pokes it to 7 or 5kV, and if an electrical potential difference is raised further, it increases concentration gradually. NO will be in the condition of only NO2 completely in the situation of zero, and NOx will change between zero from 130 ppm steeply in the shape of V character between 6.5kV and 7.5kV. Therefore, possibility that perfect processing of NO and disassembly of particulate matter can be processed using this property, without issuing Survival NOx is shown, and harmful exhaust gas can be completely defanged on real time according to combustion situations, such as an engine and a boiler. Adjustment of an ordinary treater was not completed at all, but even if optimal characteristics are acquired, it has finished it with concentration change of the harmful matter in the exhaust gas accompanying the operation situation of changing a lot as some conditions, without the ability following at all. Moreover, there is no solution in property degradation in use, and it is in the situation of a dismay.

[0008] Drawing 4 A is real time electrically about particulate matter, and it is equipped with the sensing function which can be processed, always supervising the processing futility in respect of two or more adsorption of the filter 60 made from the ceramics moreover. The situation of adhesion of the particulate matter of a carbon system is caught by change of electric resistance to the Lord between the electrode versions 61 prepared in the both-ends side of the filter 60 made from the ceramics, if it becomes below a value with the resistance, it will energize and particulate matter will be oxidized. The very low electrical potential difference of several V is enough as the power source used for energization, and the power source of a battery or DYNAMO is enough as it by automobile. processing of this particulate matter -- structure -- it is easy, and it can process on real time, is cheap also in price, and is the epoch-making thing which can build the system which was excellent in endurance. If what was constituted from a low-temperature catalyst, for example, an alumina, an oxidization gallium, tin, an indium for NOx decomposition, etc. in this filter made from the ceramics is supported, only this process can process the harmful matter of exhaust gas. Next, although it is the catalyst processing section of a middle process, it constitutes from a catalyst for NOx processing, and consists of alumina 5c, oxidization gallium 6c, tin, indium 7c, etc., and it supplies from a nozzle 31, generating a complement to the processing which used the plasma technic and the high-pressure composition technique for the equipment exterior or the interior for the ammonia generator 30. Thus, it is also possible to form the denitrification system established by the current technical target. Supply of an ingredient becomes unnecessary, if hydrogen is built with electrolysis etc. from the water from cooling water, such as an engine, etc. and nitrogen is supplied from the inside of air, although hydrogen and nitrogen are required for ammonia generation. Next, the final process of this Fig. is what was prepared in order to carry out residual NOx processing in the electrodischarge treatment section, and may utilize a part for the above-mentioned ammonia generation. 2d is an insulating core wire and 3d is a discharge ray and 11a high-voltage generating control section. 1b shows a frame. 70 and 71 are for it being installed in the suitable location before and behind processing of the NOx processing section of a final process by NOx or NO2 sensor, carrying out sensing of the NOx processing situation of the discharge section, adjusting an electrical potential difference and a frequency required for NOx removal, and controlling electric energy. Drawing 6 explains the approach of control. It is drawing showing an example of the processing section of the electric particulate matter of drawing 4 A, and drawing 4 B processes the resistance accompanying the particulate matter adhesion between electrode 61a prepared in the both ends of filter 60made from ceramics a by the sensor detection control section 50, it sends a signal to an incineration processing control section, and processes inter-electrode [of particle-like processing / required]. Opening and closing 54 and 54a with a signal line 53 in the switch section, they offer the cheap and highly efficient particulate matter processor which loses the nonuniformity according particulate matter to the location of a filter, and has a self-help function. 40a is a power supply terminal.

[0009] Drawing 5 explains the example of the situation that decomposition of NOx changes with the oxygen densities in gas remarkably, when decomposing a diesel exhaust gas by high-pressure discharge. Drawing 5 A shows the decomposition generation property of electrical-potential-difference-NOx at the time of 10% of oxygen densities in exhaust gas (NO and NO2), NO decomposes in connection with a power surge at the beginning, and becomes the minimum near electrical-potential-difference 6.5kv, and increases gradually more than by it. On the other hand, NO2 shows the situation of increasing in inverse proportion to reduction in NO, and hardly changing from near 6 - 6.5kv. Drawing 5 B shows the decomposition generation property of electrical-potential-difference-NOx in the case of 15% of oxygen densities (NO and NO2), and exchanges for NO carrying out decomposition disappearance even near electrical-potential-difference 5.5kv, and NO2 increases it rapidly. It disappears gradually to 5.5kv-6.5kv, and is set to 0, and the condition of 0 continues to 7.5kv(s), and more than by it, it increases as generation starts again and the electrical potential difference of NO increases. although NO2 increases slightly between 5.5-6.5kv(s) on the other hand -- a plateau condition -- ****" -- after being, a peak is reached, and after 6.5kv, after it changes to decreasing and near 7kv shows the minimal value, it changes to increasing. 7. Change to decreasing again according to the increment in NO bordering on 5kv. Drawing 5 C shows the decomposition generation property of electrical-potential-difference-NOx (NO and NO2) when an oxygen density increases further with 18%, NO and NO2 disappear greatly, and a V curve comes to appear notably. It becomes possible [disappearing completely] from an electrical potential difference 6.5 between 7kv(s). The range of full disappearance of NO is also large with 5.7 to 7.5kv(s). If this property is used, it will become possible to extinguish NOx completely. In that case, since the oxygen density in the exhaust gas from a diesel power plant is about 16%, by forming oxyecoia supply equipment into the system of the exterior or a treater, construction of a means effective in NOx reduction of it is attained. Drawing 5 D shows the decomposition generation property of electrical-

potential-difference-NOx in the case of 21% of oxygen densities (NO and NO2), and the NOx reduction property consists of 18% of oxygen densities still more notably. Thus, it becomes possible by changing the oxygen density in exhaust gas to control reduction of NOx easily. If an oxygen density is increased further or the object changed into the condition of active oxygen or ozone is supplied, while a reaction becomes remarkable much more and a property can be controlled greatly, the energy-saving effectiveness also becomes possible and very slight energy can attain removal of NOx. [0010] Drawing 6 is an explanatory view about the method of controlling for grasping the processing situation of an NOx processor and deciding energy required for processing of NOx. A sensor is arranged in the suitable location of the discharge component order passage of the NOx processing section, and the processing situation of NOx is grasped, namely, the downward tendency of NOx and a upward tendency is caught by these two sensors, for example, while increasing energy from an A point more like a B point in the case of a decreasing state and changing like D point to C point, energy can be lowered, control can be ensured, and NOx can be removed completely. Of course, it carries out by making it tie up with the oxygen density adjustment in a system if needed. [0011] Drawing 7 shows the example about the new structure of an insulating discharge ray. Drawing 7 A coils spirally two discharge rays, 3d and 3e, which were isolated and have been arranged in parallel, and constitutes the insulating discharge ray. When electric insulation falls with dirt moisture etc. by conductive matter, such as nitrogen which between two lines produced in particulate matter or discharge, and a sulfur oxide, the electric resistance between 2 lines becomes small, and the discharge engine performance falls remarkably. This is because it will be in the condition of whether to have covered with the conductor of one the insulating front face of 2d of insulators made with the alumina made in basicity-proof [heat-resistant] and discharge stops arising. In order to prevent this, an electrical potential difference is applied and energized between two discharge rays, and it enables it to purify by making it destroy by fire and evaporate by heat or discharge. This is usable also as a dirt sensor. 22d is the conductor of an insulating core wire. 17d and 17e are the insulators of the interference section of a discharge ray. Drawing 7 B shows the side cross section of the insulating discharge ray of drawing 7 A. the example of the insulating discharge ray which drawing 7 C put side by side two or more discharge rays 3f, 3g, and 3h, and was coiled spirally -- being shown -- **** -- a core wire -- it consists of conductor 22e, insulator 2e, and interference insulators 17f, 17g, and 17h. This kind of discharge insulated wires differ in the discharge engine performance remarkably with the arrangement pitch dimension of a discharge ray. The result with the most sufficient discharge property has come out [the thing of 10mm pitch] in the example of 0.3mm of diameters of a discharge ray with the outer diameter of 2mm of an insulator. As shown in Table 1, a discharge property changes with a pitch or die length a lot, and changes to 1/2 or less. A discharge property is changeable by modification of the die length by the combination and tap of a discharge ray using this phenomenon. For example, when changing a pitch, two or more discharge rays are coiled, a pitch can be changed in those connection and combination, or it can be made a like pole, can be used alternatively, and a discharge property can be changed. Although the above-mentioned is describing changing supply energy with a single discharge ray, and changing a discharge property, if it combines with two or more of these discharge rays, the width of face of control can be given and, of course, a more powerful exhaust-gas processing machine can be realized. [Table 1]

放電によるNOからNO$_2$への変換率

ピッチ (mm)	長さL=250 (mm) 電力P=9W	L=500 P=18	L=750 P=27	L=1000 P=36
1	37 (%)	44	47	51
5	40	65	60	53
10	48	84	64	58
20	51	78	63	46

Drawing 7 D shows the cross section about the structure of the insulator of an insulating core wire. 22f -- a core wire -- 2f shows with the insulator the example which is what filled the clearance with other insulating materials, was constituted in the object which the product made from the ceramics made reticulated what carried out alumite processing, or this, it was thinner, was good as for insulation, and was constituted a conductor and 2f and 2g. Drawing 7 E uses 22g of ingredient nichrome wires of heat-resistant high intensity etc. for an insulating core wire, and after covering with aluminum material 2h to the envelope and lengthening to a wire rod, it shows the cross-section section of the thin and highly efficient insulating core wire constituted from external insulator 2i, such as an alumina, to the core wire which carried out alumite processing. [0012] Drawing 8 is a graph which shows change of a property when a hydrocarbon is

intermingled in exhaust gas. When 21% of oxygen densities and the about 1000 ppm hydrocarbon which the oxygen density showed by drawing 5 D are intermingled, it is accepted that remarkable reduction of NOx stops appearing. This has suggested that NO2 is stably generable. That is, when changing NO into NO2 and carrying out oxidation removal of the particulate matter as an oxidizer, it can utilize effectively. By, of course controlling an oxygen density and the concentration of a hydrocarbon organically, a more stable highly efficient processing machine is realizable. Drawing 8 A and drawing 8 B show the NOx processing property at the time of being intermingled with 1000 ppm of hydrocarbons, 10% of oxygen densities, and 21%, respectively. In this case, although NO cannot remove completely, as for this, it is needless to say for it to be able to remove by combining the technique of above-mentioned drawing 5 in the final process of a treater. [0013] drawing 9 maintain the inside of equipment at an elevated temperature as much as possible , and by make it a thermal protection structure with the ceramics with the equipment exterior etc. so that the heating value which generate particulate matter in the case of ozone generating and corona generating by generation of heat and the discharge at the time of carry out energization incineration may be stop in exhaust gas processing and it may not escape show in it the exhaust gas equipment showed in the example carried out as [process / by small energy addition / a reaction or decomposition] . an engine exhaust port near [moreover,] -- the remaining-heat section -- preparing -- the combustion temperature of 650 degrees C of particulate matter -- as much as possible -- ****" -- promotion of a reaction and the energy-saving effectiveness are also aimed at by kicking. The exhaust gas processor described above has the epoch-making gassing technique which can follow and defang the harmful exhaust gas made into the current difficult problem in operation situations, such as an engine, with comparatively easy structure compared with conventional equipment, and can utilize it for all the fields relevant to decomposition and the reaction of gas. The usefulness cannot be overemphasized. It can utilize to disassembly of the antipollution measure and chemical reaction promotion of an automobile, a boiler, an engine, etc., promotion of combustion, harmful matter, etc. greatly effectively. and the structure which could manufacture the discharge section by industrial engineering to which the electric wire and the optical fiber progressed, and was excellent in quality and productivity -- it is easy and cost can also offer very cheap ozone and a corona generator. Moreover, the energization incineration equipment which can process particulate matter by the low battery is applicable to adsorption disassembly of the matter which has inflammability etc. Furthermore, if ammonia is generated on its own account and it takes in to an NOx denitrification system, it is applicable not only to an installation mold but a portable type device, and if many techniques of this invention are concentrated, it is expectable as what gives a bright light to especially the cure against diesel exhaust gas.

[Effect of the Invention] The effectiveness of this invention has the preeminent effectiveness which solves difficult problems, such as engine performance, cost, and maintenance nature, at once as exhaust gas after-treatment equipments, such as a boiler, including an automobile. It is 1. when the main things are enumerated next. It is the structure of an easy discharge ray and is the epoch-making thing which can control NO freely by the zero state and can follow completely the amount of generation of NO2 which decomposes NOx (NO and NO2) completely, or carries out oxidative degradation of the particulate matter at disassembly of the dynamic particulate matter in exhaust gas. Under the present circumstances, the catalyst to be used oxidizes at the low temperature of 300 degrees C, without hardly using noble metals, is made into harmless carbon dioxide gas, and can be discharged.

2. what adsorbs particulate matter at the filter made from the ceramics, detects the need part of incineration according an adsorption side to a sensor with two or more electrodes, destroys by fire alternatively and electrically with the power source of a low battery, makes a particle carbon dioxide gas and defangs it -- it is -- structure -- it is easy, and excels in the engine performance, and the device which was very excellent in the maintenance nature which can be processed on onboard real time can be realized. Moreover, with the catalyst of the low price which hardly uses noble metals, NOx is decomposed, or it has independent ammonia generation equipment, and efficient and the price exhaust gas processor which was excellent in maintenance nature can be offered combining the more excellent denitrification plant.

Very Simple and Strong Electric-Wire-like Deer Also Constitutes Insulating Clothing from an Alumina of Thin and Reliable Entering Zirconia Etc. in Discharge Section. To Discharge Ray 3. Lead-Wire Independent, Ceramic Line, Etc., By forming further two or more discharge rays in the network structure, a discharge property, and reinforcement and endurance are increased, a catalyst is supported on a ceramic line, and the epoch-making exhaust gas processing element which gave efficient and a low price compound function as what gave the catalysis can be offered. ****

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]
図.1A

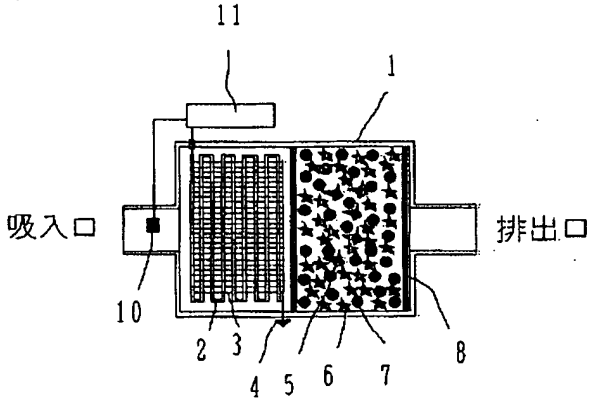
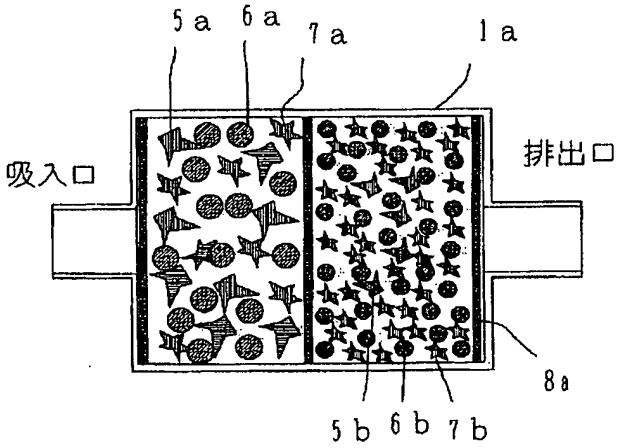
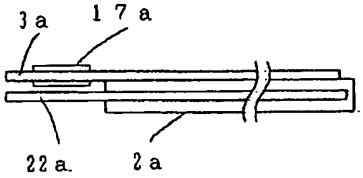


図.1B



[Drawing 2]

図. 2 A



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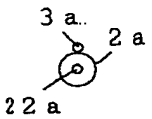

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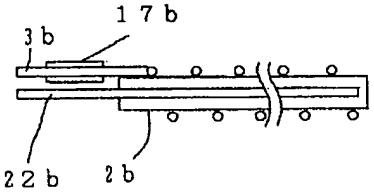

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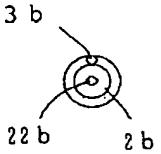

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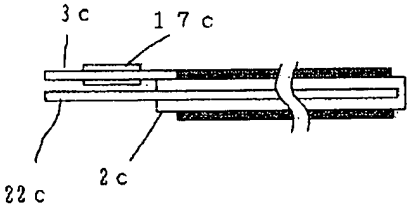

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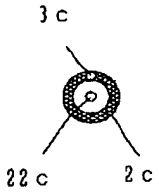
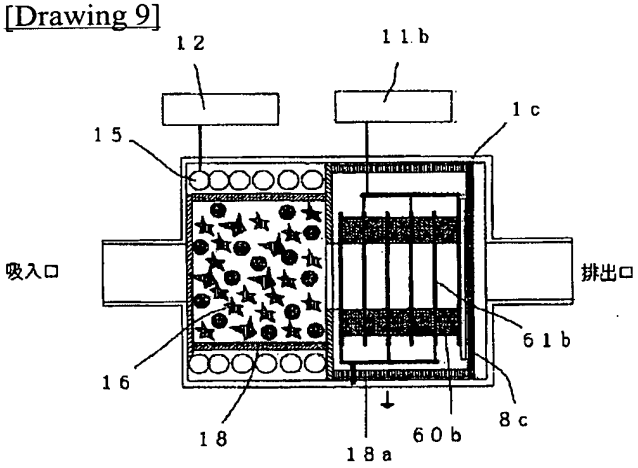
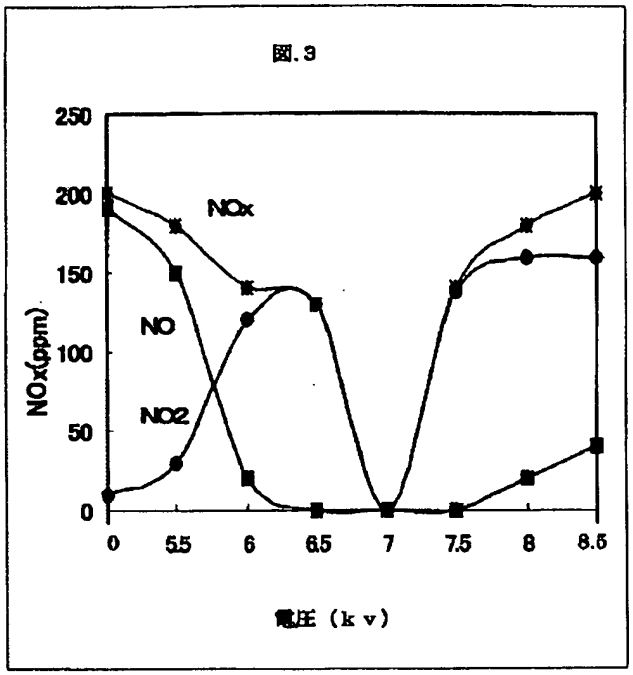


[Drawing 9]



[Drawing 3]



[Drawing 4]
図. 4 A

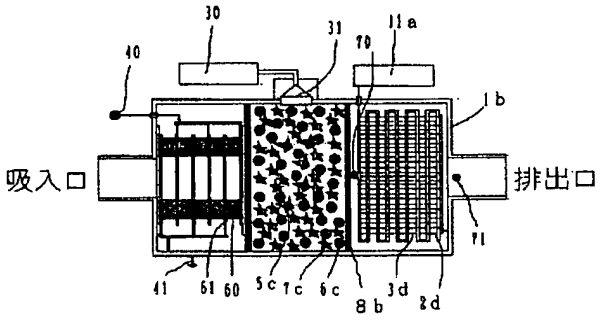
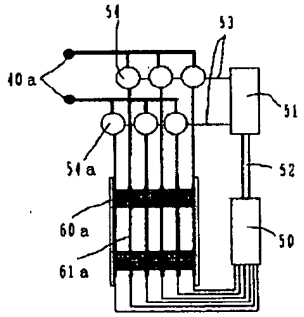


図. 4 B



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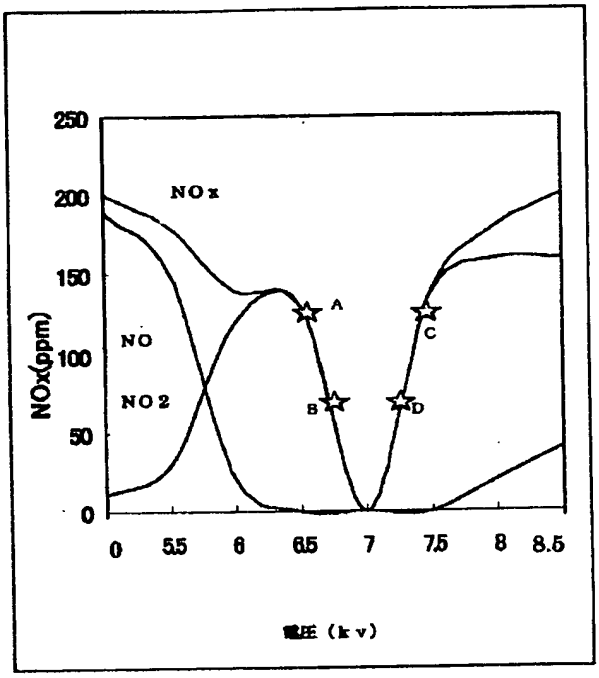
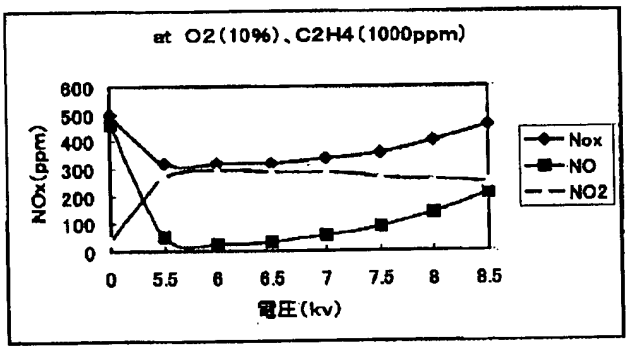


[Drawing 8]

A



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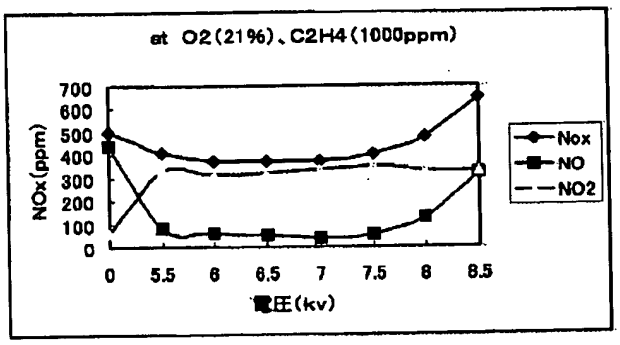
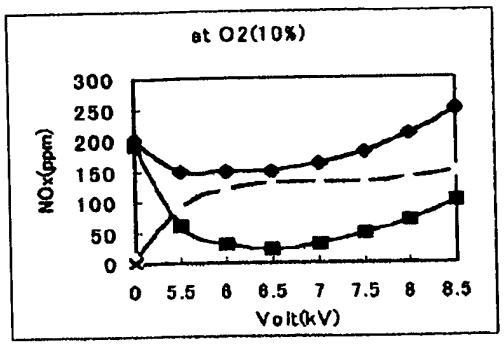


[Drawing 5]

図.6A



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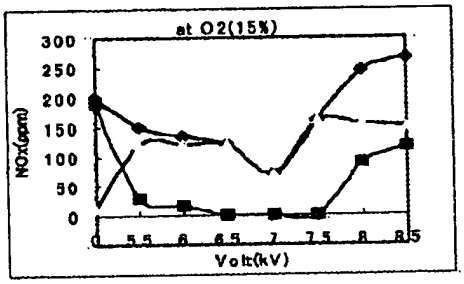


図.6C

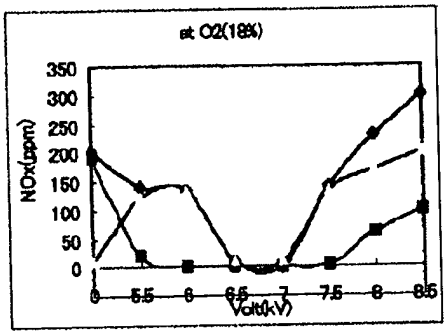
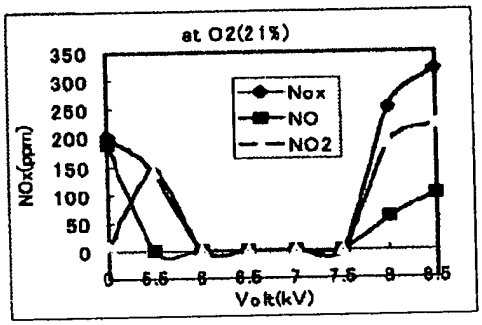
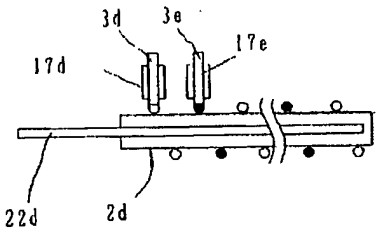


図..6D



[Drawing 7]

図. 7 A



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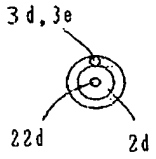

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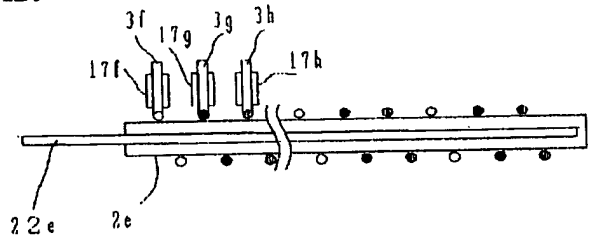

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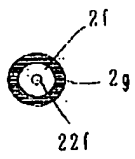
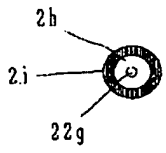


図. 7 E



[Translation done.]